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Comparative analysis of disposition maps based on statistical modelling in selected catchments in the Niedere Tauern, Austria.

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In the context of several projects dealing with hazard and risk analysis in the Niedere Tauern mountain range (Austria) disposition maps regarding landslides of three drainage catchments were generated. This was accomplished by a statistical modelling approach using logistic regression. The aim of the analysis was the qualitative detection of areas with high landslide disposition at a regional scale in order to concentrate detailed hazard analysis on such areas.

The identification and mapping of relict and active landslides in the model design area is the fundamental precondition for the development of the disposition model. This concept is based on the assumption that future mass movement events will most likely occur under similar general conditions than previous events. The second fundamental precondition is the availability of a reliable database of relevant terrain characteristics. The input data for modelling were derived from: existing maps, a digital terrain model (DTM), the analysis of aerial photographs, and complementary fieldwork. The spatial information covered geological, hydrological and a number of geomorphological parameters as well as vegetation data.

The design of the model comprehended the selection of the most relevant parameters by stepwise backward elimination and the weighting of the selected parameters in the calculated model. Based on this approach, the highest explanatory values thus are represented by the variables ‘vegetation’, ‘lithology’ and ‘geomorphological unit’. The resulting variable ‘landslide disposition’ was divided into five classes based on deciles for graphical representation in maps.

The validation was done by the transference of the generated model to two adjacent drainage catchments (test areas) with similar natural conditions. The same data pool as in the design area was available for them.

The three analysed drainage catchments have some characteristics in common but on the other hand others differ significantly. The spatial dimensions of the study areas vary between 9.25 and 18.1 km^2. The lengths of their torrents range from 5.1 to 7.5 km. Generally, altitudes between 700 and 2,600 m a.s.l. are represented resulting in a number of vegetation zones. The geological situation is characterised predominantly by different crystalline rocks such as mica schist, gneiss, amphibolites as well as phyllites. Furthermore, morainic deposits dating from the Pleistocene glaciation are widespread. Both, geomorphology and morphodynamics are determined by the effects of the Pleistocene glaciation. The support of the overdeepened mountain slopes vanished after the valley glaciers retreated approximately 14.7–17.0 ka BP. As a consequence, deep-seated slope deformation processes started to act, thereby destabilising many slopes, loosening the rock deeply and thus enhancing erosional processes.

The comparative analysis of the three test areas comprises (i) a frequency distribution of single characteristics and combinations of characteristics with regard to landslide disposition and (ii) the detailed interpretation of resulting zoning maps regarding the tectonic and geological conditions as well as the Late Pleistocene – i.e. Late Glacial - and Holocene evolution of the valley.